# "Pseudo Cereal and their potential functional as Functional Food Ingredients"

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# Abstract

Traditional foods like buckwheat, quinoa, and amaranth have been rescued by the growing demand for healthier and more functional diets. Pseudocereals were extremely essential to ancient civilizations. Because they have a better nutritional value than many cereals in the current diet, they are gaining popularity in the markets. Furthermore, they may be beneficial to persons who are allergic to typical cereals. Pseudocereals have been successfully used in numerous baked items, fermented beverages, and extruded products. The main characteristics, nutritional value, and application of pseudocereals as functional food are the emphasis of this chapter.

# Introduction

Pseudocereals are dicotyledonous plant that resembles true cereals in function and composition. These contain no gluten and so offer a wide range of applications in gluten-free compositions. Pseudocereals are high in protein, fibre, and minerals, and they also have bioactive and health-promoting properties (Thakur and Kumar, 2019)**.** Cereals, pseudo-cereals, and legumes are good sources of proteins, lipids, carbs, vitamins, and minerals in the human diet. Probiotic strains are also used in cereals and pseudocereals for the fermentation process and the development of new functional food products (Sharma et al., 2021). Functional components such as antioxidants, dietary fibre, minerals, probiotics, and vitamins are abundant in fermented food products (Alvarez-Jubete et al., 2010). The development of novel functional foods is a popular trend in the food processing industry. Because of the presence of nutraceutical components, functional foods provide distinct health benefits beyond their nutritional features. Nutraceuticals are nutritional components with therapeutic qualities that aid in the maintenance of health, the modulation of immunity, and the avoidance of lifestyle disorders (Wang et al., 2012). Functional foods provoke the public's attention by preventing or delaying a variety of age-related issues such as osteoarthritis, alzheimer's disease, and diabetes (González-Sarrías et al., 2013). Because these grains contain several nutraceutical components, including them in one's diet has the potential to enrich one's diet while also providing health benefits, particularly for people with celiac disease who are gluten intolerant (Morales et al., 2021).

Cultivated plants that yield grains for human consumption include pseudocereals, cereals, legumes, oilseeds, and nuts, among others. Pseudocereals combine the terms cereal and pseudo, which refers to grains generated by grasses (Wrigley et al., 2015). Pseudocereals are grains that have nutritional properties similar to cereals but are generated by other botanical families (Martínez-Villaluenga et al., 2020). While cereals are produced by Poaceae species, pseudocereals occur in families of eudicots (Cactaceae, Amaranthaceae, Caryophyllaceae, Trapaceae and Polygonaceae) and monocots (Cyperaceae, Commelinaceae,and Zingiberaceae) (Schmidt et al., 2021). Quinoa (*Chenopodium quinoa* Willd, Amaranthaceae), buckwheat (*Fagopyrum esculentum* Moench and *Fagopyrum tataricum* Gaertn. Polygonaceae) and amaranth (*Amaranthus* spp., Amaranthaceae) are currently the main pseudocereals crops in the world (Wrigley et al., 2015; Martínez-Villaluenga et al., 2020). They are nutritionally high in protein content and quality, as well as the absence of gluten. For the management of these plants, the vast genetic variety and resilience to severe climatic conditions are particularly important traits (Joshi et al., 2018). Pseudocereals are "subexploited foods" and includes non-grasses plant species that are not related to cereals but have similar qualities and functions. "Subexploited foods" are foods that were part of various population diets for years before being displaced in the early twentieth century by foods that now dominate the world population diet (Morales et al., 2021). Pseudocereal crops have been proposed as significant resources for food security since the world's population is expected to exceed 9,700 million people by 2050. The Food and Agriculture Organization (FAO) defines food security as a condition in which all people have physical and economic access to sufficient, safe, and nutritious food that fits their dietary needs and preferences for an active and healthy life at all times (FAOSTAT, 2015). Pseudocereals are economically, socially, ecologically, nutritionally, and functionally important due to their agronomic qualities, ecological adaptation to unfavourable environments, and high nutritional content (Morales et al., 2021). Latin American countries such as Bolivia, Ecuador, and Peru were the biggest producers of these pseudocereals because they ate them as a staple cuisine. Following the conquest by the Spanish, the cultivation of these foods declined, giving way to grains such as wheat and barley. Furthermore, because some pseudocereals include anti-nutritional elements that require specific washing techniques to reduce their levels and make the food suitable for human consumption, pseudocereal manufacturing was often intended for animal feed (Arendt and Dal Bello, 2011). Other countries, such as China and Russia, are now major producers of pseudocereals like buckwheat (close to 1 million tonnes in 2018) (FAOSTAT, 2018). Despite their importance in the diets of many historical civilizations, pseudocereals account only a modest percentage of global grain production today. However, in a time when much is being said about food security, nutritional quality, and food usefulness, the cultivation of these plants has the potential to grow in the near future (Schmidt et al., 2021).

# Pseudocereals as Functional Foods

Food is any substance that can nourish an organism when digested (Schmidt et al., 2021). Functional meals, on the other hand, have the ability to influence the body's physiological functioning in addition to satisfying their basic nutritional duties (Silva et al., 2016). As a result, the health and quality of life of those who consume them improves, while the risk of disease decreases (Iglesias et al., 2010). The notion of functional food first emerged in Japan in the 1980s, when the Japanese Ministry of Health, Labour, and Welfare decided that some foods would be given a seal of approval for use in the health field (FOSHU: Foods for Specified Health Use) (Costa et al., 2016). Functional foods were classified in the early 1990s in the United States of America (USA) as foods that had a favourable influence on an individual's health after ingestion (Caballero et al., 2015). After many discussions, the European Union decided in 1999 to streamline the necessary procedures for demonstrating that particular minerals present in certain foods have a favourable impact on health (Schimdt et al., 2021). Although there is no legal definition of "functional foods" in Brazil, the legislation confirms the functional and health aspects of foods by setting rules for the registration of foods that contain these properties in their compositions. The molecules that each functional meal produces determine the method of action in the body (Costa et al., 2016). Pseudocereals are considered functional foods because of their great nutritional value. The various bioactive components of various pseudocereals are represented in Figure 1.Buckwheat, for example, includes carotenoids (beta-carotene and lutein), which regulate cell antioxidant activity (Tuan et al., 2013) and dietary fibres, both water soluble and insoluble, which lower blood cholesterol and glucose levels. Buckwheat is also the only grain that includes rutin, a flavonoid that helps to strengthen blood vessels (Joshi et al., 2019). Amaranth has the ability to lower serum cholesterol levels in general, primarily to the combined action of various components (Schimdt et al., 2021). Amaranth oil contains more phytosterols than other vegetable oils, which have hypocholesterolemic properties. β-sitosterol (607 μg 100 g−1), makes up 95% of total sterols, followed by campesterol (8.8 μg 100 g−1) and stigmasterol (5.6 μg 100 g−1). Other products, such as soybean oil, olive oil, cotton oil, peanut oil and, contain; 153; 303; 131 and 123 μg 100g-1 of β-sitosterol, respectively (Marcone et al., 2003). The amaranth grains' soluble fibres and the unsaturated hydrocarbon squalene have hypocholesterolemic properties. Squalene also has anticarcinogenic and antioxidant properties (He et al., 2002). Quinoa and amaranth, in addition to these substances, have higher protein levels than grains, making them ideal functional foods (Schimdt et al., 2021).

# Nutritional Characteristics of Pseudocereals

## Buckwheat

Buckwheat is a member of the Polygonaceae family and genus (Fagopyrum spp). It is the best growing crop in such regions since it grows at higher elevations for a short period of time (3-4 months). Buckwheat can withstand harsh temperatures, a lack of water, low soil quality, and a variety of environmental conditions (Nalinkumar and Singh, 2020). Proteins, polysaccharides, dietary fibre, lipids, polyphenols, and micronutrients are all present in buckwheat grain (Qin et al., 2010). Whole buckwheat groats are the hulled seeds and contain 550 mg/g starch, 120 mg/g protein, 70 mg/g total dietary fibre (TDF), 40 mg/g lipid, 20 mg/g soluble carbohydrates, and 180 mg/g other components such as organic acids, phenolic compounds, tannins, phosphorylated sugars, nucleotides, and nucleic acids (Im et al., 2003). Buckwheat flour provides roughly 7.7% more fat and 15-30% more fibre than wheat flour (Lin et al., 2009; Qin et al., 2010). In addition to these advantages, buckwheat has a lower real protein digestibility of 79.9% when compared to maize (93.2%) (Belton and Taylor, 2002). The decrease in the protein digestibility of buckwheat's can be linked to its antinutritional properties, such as α-amylase inhibitors, trypsin inhibitors, polyphenols and phytic acid (Wang and Zhu, 2015). Buckwheat is one of the leading causes of anaphylaxis/food allergy in South Korea and Japan (Loh and Tang, 2018). Low molecular weight proteins found in buckwheat flour may be the source of many allergies (Taylor and Awika, 2017).

## Amaranth

Grain amaranth flour contains 66.17 g (carbohydrates), 9.3 g (dietary fibre), lipids (ω−3 and ω−6), 3.04 g (minerals), squalene, tocopherols, phenolic compounds, flavonoids, phytates, and vitamins making it a "super food". Grain amaranth flour has a protein level of 20.62 % higher than wheat flour (Brennan et al., 2012). It helps in the reduction of inflammation and cholesterol, prevention of diabetes and constipation, and keeping bones strong (Soriano-Garcia et al., 2018).

## Quinoa

Quinoa (*Chenopodium quinoa* Willd.) belongs to the Chenopodiaceae family. Chenopodium is a genus of over 250 species that can be found all over the world. It is a graniferous plant native to South America and has been domesticated for thousands of years by people living in the Andes, primarily in Peru and Bolivia (Filho et al., 2017). One serving of quinoa (approximately 40 g) meets a major portion of the dietary recommendations (RDA) primarily vitamins, minerals, and essential amino acids (Vilcacundo & Hernández-Ledesma, 2017). Quinoa seeds contain a protein concentration of 14.1% on average, ranging from 8-22%. On a dry basis, cereals like barley, wheat, and rice (Oryza sativa L.) have an average protein level of 13.8; 10.7; and 7.0%, respectively, whereas most legumes have a greater protein content, with 22.1 and 33.6% in beans and peas (*Phaseolus vulgaris* L.). The protein is primarily present in the endosperm. Albumin and globulins make up 44 to 77% of the protein fraction, while prolamins, a group of gluten-related proteins, make up only 0.5 to 7.0% of the protein fraction or are even absent in some kinds (Fuentes et al., 2013; Schimdt et al., 2021).

# Utilisation of Pseudocereals for Food Products

## Gluten-Free Foods

The consumption and demand for gluten-free products has increased all over the world due to an increased prevalence of gluten-related disorders like CD, or the intolerance to gluten and wheat, called “non-celiac wheat or gluten sensitiv­ity” (NCWS or NCGS) (Shewry and Hey, 2016). A study by Junker et al. (2012) identified amylase–trypsin inhibitors (ATIs) as potential triggers of innate im­munity in wheat, which should be responsible for NCWS or NCGS. In addition to persons suffering from the aforementioned disorders, glu­ten-free products are increasingly being purchased by people because of their health-promoting image, especially if they contain pseudocereals. During the last ten years many gluten-free products have been developed and marketed, leading to a great increase in consumption (Shewry and Hey, 2016). As result of the efforts of the research community, products with higher functional and nutritional quality have been developed. Generally pseudocereals are very low in prolamins because they are dicotyledonous plants and hence do not contain protein fractions that are toxic to CD patients. Although it is only recently that some specific studies have been undertaken to actually prove this. In summary, the consumption of amaranth and other pseudocereals is safe for celiacs and thus their products can be included in a gluten-free diet (D’Amico et al., 2017).

The use of amaranth, quinoa and buckwheat for the production of gluten-free pasta was studied by Schoenlechner et al. (2010). The results showed that pasta produced from amaranth had decreased texture firmness and cooking time, while pasta from quinoa mainly showed increased cooking loss. In buckwheat pasta, the least negative effects were observed. By combination of all three raw materials into one flour blend in the ratio of 60% buckwheat, 20% amaranth and 20% quinoa, the dough matrix was improved. Dough moisture had to be low­ered (30% vs. 34.5% in wheat pasta). The addition of isolated protein (the most suitable was egg albumen) had the highest effect on improving pasta firmness. For the production of gluten-free pasta, the role of starch and its properties are important (Marti et al., 2011). Phenomena related to starch retrogradation were found to play a central role for the final texture of the products (Mariotti et al., 2011). Thus more attention is being paid on the technology of pasta mak­ing, utilising pre-gelatinised flours or dough, or applying different temperature regimes (Marti and Pagani, 2013). Both approaches seem to be promising for improving gluten-free pasta quality. De Arcangelis et al. (2020) used gelatinized buckwheat flour alone or in combination with maize and rice and showed that gelatinization of the three flour blends allowed to obtain pasta with the highest quality and texture. On the other hand, Singh and Liu (2021) evaluated roasting and jet-cooking of amaranth flour to improve noodle making. Raw, jetcooked and roasted amaranth flour noodles were overall softer than those produced with wheat flour. Jet-cooking was less suitable for noodle making due to its partial disintegration of the pasta during cooking, whereas roasted amaranth flour showed a good potential for replacing wheat flour in gluten-free noodles. Further hydrothermal treatments have shown to improve the technological and physiological properties of amaranth pasta (Rudra et al., 2020), while the application of sourdough additionally improved the nutritional quality of quinoa pasta (Carrizo et al., 2020).

## Beverages /Drinks

Cereal beverages are indigenous to many regions in the world, but also in the Northern Countries they are more commonly consumed as an alternative to milk or to complement a healthy or environmentally friendly life style. The demand for non-dairy beverages based on plants is therefore a growing market (Bender and Schönlechner, 2021). Dezelak et al. (2014) analysed the brewing attributes of quinoa in comparison with barley, reporting that it had lower malt extracts, longer saccharification times, and higher total protein and fermentable amino nitrogen contents. The quinoa beer contained some distinctive volatile substances not found in barley beer and had many unique properties. Pineli et al. (2015) reported that quinoa milk provides a novel alternative to current milk-substitute products that cause no known adverse effects in humans and that have increased protein content and a low glycaemic index. Lee and Park (2013) varied the concentrations of buckwheat saccharification solution added to milk, followed by fermentation with commercially available mixed strains of lactic acid bacteria. They observed that undesirable compounds, such as acetic acid and 2-butanone, decreased as the buckwheat solution concentration increased, so the flavour quality of plain yogurt improved by adding buckwheat (Lee and Park, 2013). Tartary buckwheat sprout was also mixed with mung beans, black rice, and skimmed milk with sweeteners to develop a yogurt with health-promoting properties (Wang et al., 2013). Buckwheat tea is a popular health product in Asian and European countries, made from flowers, leaves or hulls (Giménez-Bastida et al., 2015). In China it is common to find buckwheat tea. It is produced by soaking, steaming, dehulling, and baking buckwheat seeds. The final buckwheat tea product is in granule form, with an attractive yellowish colour and pleasant baked flavour (Qin et al., 2014).

## Infant food

Quinoa is the pseudocereal most used for infant food. An infant food product was manufactured by drum-drying quinoa flour slurry by Ruales et al. (2002). It was shown that the product was a potential source of valuable nutrients such as protein, vitamin E, thiamine, iron, zinc and magnesium for preschool children. Mezquita et al. (2012) also developed a beverage with a high protein content for the diet of pre-schoolers by using a mix of Chilean mesquite, lupin and quinoa. Repo-Carrasco et al. (2003) reported that quinoa and kañiwa can be used in weaning food mixtures. They formulated two dietary mixtures, quinoa–kañiwa–beans and quinoa–kiwicha–beans, both with high nutritional value. The mixtures had protein efficiency ratio (PER) values close to that of casein (2.5): 2.36 and 2.59, respectively. Cook et al. (1997) evaluated the absorption of iron contained in, or added to, dry cereals used for infant feeding (wheat, corn, rice, millet, oat, and quinoa). They concluded that the type of cereal grain has little influence on iron bioavailability of infant cereals with the exception of high absorption in corn and modestly low absorption in quinoa, probably because of its high levels of phytates (Haros and Sanz-Penella, 2017).

## Extrusion cooking

Extrusion cooking is a process where at high temperatures and high pressure, induced by high shear forces, starchy materials is cooked and transformed into ready-to-eat products in a very short time. Starch is gelatinized, the proteins are denatured, while nutrients are retained to a high extend, due to the rather short exposure to heat. The obtained extrudates can be formulated and consumed directly as snacks or breakfast cereals, overall, a wide range of consumer endproducts can be manufactured by this technology (Bender and Schonlechner, 2021). In this regard, Guerra-Matías and Areas (2005) investigated starch digestibility in an extruded product formulated with amaranth. The glycaemic index and insulinemic response were determined in healthy women. The results indicated high glycaemic response with fast digestibility in the amaranth snack and white bread (as control), whereas the snack showed a greater capacity for stimulating insulin release than the control. Ramos Diaz et al. (2017) investigated the extrusion cooking properties of maize blended with amaranth or quinoa, and achieved expanded extrudates even at an addition level of up to 50%. Content of fatty acids and tocopherols were reduced in the extrudates, while the content of total phenolic compounds and folate were only little affected. This study proved that extrudates containing up to 50% amaranth or quinoa can maintain some key physical properties (e.g., high SEI, low stiffness) and the added nutritional value (e.g., increased content of folate). Replacement of wheat or maize by amaranth or buckwheat flours for the production of changed the nutritional quality of extruded breakfast cereals also in the study of Brennan et al. (2012). All of the extruded products made with the inclusion of pseudocereals showed a significant reduction in readily digestible carbohydrates and slowly digestible carbohydrates compared to the control product during predictive in vitro glycemic profiling. For quinoa it was shown that extrusion cooking increased protein crosslinking in quinoa and the amount of soluble fibre (Kuktaite et al., 2021).

# Foods and non-foods uses

The use of pseudocereals in food has increased substantially, and research has even extended to non-food applications. Quinoa has been proposed as a crop for NASA's CELSS (Controlled Ecological Life Support System). Plants will be used to remove carbon dioxide from the atmosphere, providing food, oxygen, and water for crews on long-term human space trips, according to the CELSS idea. Quinoa was chosen because of its nutritional benefits and great productivity. To get the correct amino acid balance, CELSS has had to mix the nutritional qualities of multiple crops in the past, but quinoa appears to provide it on its own (Schlick and Bubenheim, 1996). Quinoa is a nutritious, healthful, and easily farmed food that NASA feeds to astronauts on long space journeys (TWB, 2014). Aside from that, buckwheat has been used to make a variety of foods such as tea, yoghurt, vinegar, alcoholic beverages and dark sauce (Bender and Schönlechner, 2021). Quinoa milling fractions with high fibre content have been employed as binders in the manufacturing of bologna-style sausages. The fibre-rich quinoa fraction improved the emulsion's stability and reduced the sausage's lipid oxidation and water activity. It was determined that adding nitrite to the product was unnecessary because the quinoa fractions already provided enough colour (Fernandez-Lopez et al., 2020). Quinoa and buckwheat flour have also been employed as binders for beef patties, with positive results in terms of nutritional, sensory, and shelf-life qualities (Bahmanyar et al., 2021). Amaranth and quinoa starch could be utilised as a thickening for frozen foods because of their great freeze-thaw durability and low amylose concentration. Salad dressings, cream soups, sauces, and pie fillings could all benefit from their resistance to retrogradation. Buckwheat has been the most researched pseudocereal in the non-food world. The production of biopolymers for the development of edible and biodegradable films is another unusual application of pseudocereals. This could be a means to expand their applications and open up new markets, as well as a way to replace non-biodegradable synthetic plastic in pharmaceutical and food applications (Tapia-Blácido et al., 2007). Buckwheat protein from distillers dried grains has been used to make composite edible films for food packaging (Wang et al., 2017), and buckwheat peptides could be employed as a functional ingredient in nutraceutical research (Li et al., 2019). Quinoa flour has also demonstrated the potential to create appropriate biofilms for use in food packaging. When compared to polyethylene films, they have a higher blocking ability and have less solubility and water permeability than certain polysaccharide films (Salas-Valero et al., 2015).

# Conclusion and Future Perspective

Despite the fact that they are neither grasses nor actual cereal grains, plants that produce fruits or seeds that are utilised and consumed as grains are referred to as pseudocereals. Many bioactive substances with health-promoting properties, such as polyphenols, phytosterols, squalene, and saponins, are abundant in preudocereals. Soaking, germination, popping, heating, and fermentation have all been shown to improve the nutritional value of these grains as well as the products created by their incorporation. These can be widely used in the manufacture of gluten-free processed items such as pasta, bread, and confectionery products due to their gluten-free properties. The necessity for gluten-free products based on pseudocereals to be commercialised is significant, as the market for these items is severely lacking. Pseudocereals could also be used to create new probiotic meals. Pseudocereals should be included in the everyday diet of the global population due to their great nutritional value. Interest in these meals is growing as the nutritional and bioactive qualities of these plants become well understood. Pseudocereals have a lot of potential as a natural source of biologically active compounds, especially peptides and protein hydrolysates, which have anti-inflammatory, antioxidant, and antihypertensive properties, and pseudocereal-based products could be very useful in improving celiac population health and quality of life. Yet, substantial research is needed, particularly in vivo studies in animal models and clinical trials, to show that pseudocereal protein derived peptides have health advantages and to study the mechanisms of action that contribute to bioactive qualities.

**Table 4: Pseudo-cereals based gluten free diet**

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| --- | --- | --- | --- | --- |
| **Gluten free foods**  | **Type of pseudocereals** | **Ingredients**  | **Remarks**  | **References** |
| Noodles  | Quinoa  | Potato starch, extruded and non-extruded quinoa, tara gum with or without addition of lupine flour, vegetable proteins and Pox enzyme | High noodle quality, protein and fiber contents | Linares-García et al. (2019) |
| FermentedBeverage  | Quinoa  | Quinoa seeds fermented with lactic acid bacteria strains | High protein, fiber, vitamins and minerals levels; viable and stable microbial countsduring storage microbial load during storage time | Ludena-Urquizo et al. (2017) |
| Pasta | Quinoa and amaranth | Rice flour replaced by quinoa and amaranth flours and egg white | Good elasticity and sensory acceptability | Makdoud and Rosentrater, (2017) |
| Spaghetti  | Amaranth  | Dried and extruded potato pulp,amaranth flour at differentconcentrations | Higher yield, better color and cooking characteristics than fresh commercial wheat pasta | Bastos et al. (2016) |
| Snacks  | Quinoa  | Quinoa flour with spices | Good water activity, textural and sensory acceptability. | Khalon et al. (2016) |
| Wafer sheet  | Buckwheat  | Rice replaced by corn, chestnut or buckwheat flours | Rice-buckwheat flours based wafer sheet formulations had the closest value of consistency, flow behavior index, hardness and fracturability to wheat-based wafer sheet | Mert et al. (2015) |
| Bakeryproducts | Quinoa  | Rice and oat flour replaced by roasted quinoa flour | Good sensory attributes | Kaur and Kaur, (2017) |
| Cookies | Buckwheat  | Rice flour replaced bytartary buckwheat maltor flour | Higher total phenolic, rutin and quercetin contents and antioxidant activity and lower glycemic index | Molinari et al. (2018) |
| Cookies | Quinoa  | 100% quinoa flour  | Exhibited good textural and sensory quality and high antioxidant activity | Jan et al. (2018) |
| Beef burger | Quinoa and buckwheat  | Soy protein powder and bread crumb replaced by quinoa and buckwheat flour  | Higher content of mineral, sensory acceptance and shelf life stability  | Bahmanyar et al., 2021 |
| Bread  | Buckwheat  | Chia seed and buckwheat flour | Higher amount of protein, insoluble dietary fibers, ash, and alpha-linolenic acid; Improvement in total antioxidant capacity  | Costantini et al., 2014 |
| Bread  | Buckwheat  | 100% buckwheat flour  | Enhancement of iron, zinc, calcium potassium, phosphorus, magnesium and copper; Decrease in bread specific volumeIncrease in bread hardness  | Sayed et al. (2016) |
| Bread | Quinoa and amaranth | Rice flour, potato starch, cassava starch and sour tapioca starch replaced by quinoa or amaranthwhole flours | Showed similar specific volume, firmness and water activity; High protein, lipid and ash content and larger alveolar area | Alencar et al. (2015) |
| Flatbread | Quinoa  | Mixture of quinoa, peanutoilcake and broccoli/beet | Higher protein and mineral contents and acceptance  | Khalon et al. (2019) |

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**Fig 1: Bioactive compounds of pseudocereals**

**References**

1. Lopes, Cristiane de Oliveira, Maria de Fátima Píccolo Barcelos, Cíntia Nayara de Goes Vieira, Wilson César de Abreu, Eric Batista Ferreira, Rafaela Corrêa Pereira, and Michel Cardoso de Angelis-Pereira. "Effects of sprouted and fermented quinoa (Chenopodium quinoa) on glycemic index of diet and biochemical parameters of blood of Wistar rats fed high carbohydrate diet." *Journal of food science and technology* 56, no. 1 (2018): 40-48.
2. Thakur, Priyanka, and Krishan Kumar. "Nutritional importance and processing aspects of Pseudo-cereals." *J. Agric. Eng. Food Technol* 6 (2019): 155-160.
3. Alvarez-Jubete, Laura, Mark Auty, Elke K. Arendt, and Eimear Gallagher. "Baking properties and microstructure of pseudocereal flours in gluten-free bread formulations." *European Food Research and Technology* 230, no. 3 (2010): 437-445.
4. Wang, Chung-Yi, Sz-jie Wu, Jong-Yi Fang, Ya-Ping Wang, and Yuan-Tay Shyu. "Cardiovascular and intestinal protection of cereal pastes fermented with lactic acid bacteria in hyperlipidemic hamsters." *Food research international* 48, no. 2 (2012): 428-434.
5. González-Sarrías, Antonio, Mar Larrosa, María Teresa García-Conesa, Francisco A. Tomás-Barberán, and Juan Carlos Espín. "Nutraceuticals for older people: Facts, fictions and gaps in knowledge." *Maturitas* 75, no. 4 (2013): 313-334.
6. Morales, D., Miguel, M., & Garcés-Rimón, M. (2021). Pseudocereals: a novel source of biologically active peptides. *Critical reviews in food science and nutrition*, *61*(9), 1537-1544. Wrigley, Colin W., Harold Corke, Koushik Seetharaman, and Jonathan Faubion, eds. *Encyclopedia of food grains*. Academic Press, 2015.
7. Martínez-Villaluenga, Cristina, Elena Peñas, and Blanca Hernández-Ledesma. "Pseudocereal grains: Nutritional value, health benefits and current applications for the development of gluten-free foods." *Food and Chemical Toxicology* 137 (2020): 111178
8. Schmidt, Davi, Marta Regina Verruma-Bernardi, Victor Augusto Forti, and Maria Teresa Mendes Ribeiro Borges. "Quinoa and Amaranth as Functional Foods: A Review." *Food Reviews International* (2021): 1-20.
9. Schmidt, Davi, Marta Regina Verruma-Bernardi, Victor Augusto Forti, and Maria Teresa Mendes Ribeiro Borges. "Quinoa and Amaranth as Functional Foods: A Review." *Food Reviews International* (2021): 1-20.
10. Morales, Diego, Marta Miguel, and Marta Garcés-Rimón. "Pseudocereals: a novel source of biologically active peptides." *Critical reviews in food science and nutrition* 61, no. 9 (2021): 1537-1544.
11. Food and Agriculture Organization of the United Nations (FAOSTAT). 2018. FAOSTAT online database. <http://www.fao.org/faostat/en/> #data/QC/
12. Food and Agriculture Organization of the United Nations (FAOSTAT). 2015. Food security and the right to food. <http://www.fao.org>
13. Arendt, Elke, and Fabio Dal Bello, eds. *Gluten-free cereal products and beverages*. Elsevier, 2011.
14. Silva, Ana Carolina Couto, Nayara Aparecida Silva, Mônica Cecília Santana Pereira, and H. S. Vassimon. "Alimentos contendo ingredientes funcionais em sua formulação: revisão de artigos publicados em revistas brasileiras." *Revista Conexão Ciência* 11, no. 2 (2016): 133-144.
15. Iglesias, M. J., A. P. Alejandre, and J. C. E. de Gea. "Alimentos saludables y de diseño específico. Alimentos funcionales." (2010).
16. Costa, Neuza Maria Brunoro, and Carla de Oliveira Barbosa Rosa. *Alimentos funcionais: componentes bioativos e efeitos fisiológicos*. Editora Rubio, 2016.
17. Caballero, B., Finglas, P. and Toldrá, F., 2015. *Encyclopedia of food and health*. Academic Press.
18. Tuan, Pham Anh, Aye Aye Thwe, Jae Kwang Kim, Yeon Bok Kim, Sanghyun Lee, and Sang Un Park. "Molecular characterisation and the light–dark regulation of carotenoid biosynthesis in sprouts of tartary buckwheat (Fagopyrum tataricum Gaertn.)." *Food chemistry* 141, no. 4 (2013): 3803-3812.
19. Joshi, D. C., Ganesh V. Chaudhari, Salej Sood, Lakshmi Kant, A. Pattanayak, Kaixuan Zhang, Yu Fan, Dagmar Janovská, Vladimir Meglič, and Meiliang Zhou. "Revisiting the versatile buckwheat: reinvigorating genetic gains through integrated breeding and genomics approach." *Planta* 250, no. 3 (2019): 783-801.
20. Marcone, Massimo F., Yukio Kakuda, and Rickey Y. Yada. "Amaranth as a rich dietary source of β-sitosterol and other phytosterols." *Plant Foods for Human Nutrition* 58, no. 3 (2003): 207-211.
21. He, Han-Ping, Yizhong Cai, Mei Sun, and Harold Corke. "Extraction and purification of squalene from Amaranthus grain." *Journal of Agricultural and Food Chemistry* 50, no. 2 (2002): 368-372.
22. Nalinkumar, Aneesha, and Pratibha Singh. "An Overview of Buckwheat Fagopyrum spp An Underutilized Crop in India-Nutritional Value and Health Benefits." *International Journal of Medical Research & Health Sciences* 9, no. 7 (2020): 39-44.
23. Im, Ji-Soon, Harold E. Huff, and Fu-Hung Hsieh. "Effects of processing conditions on the physical and chemical properties of buckwheat grit cakes." *Journal of agricultural and food chemistry* 51, no. 3 (2003): 659-666.
24. Qin, Peiyou, Qiang Wang, Fang Shan, Zhaohua Hou, and Guixing Ren. "Nutritional composition and flavonoids content of flour from different buckwheat cultivars." *International Journal of Food Science & Technology* 45, no. 5 (2010): 951-958.
25. Lin, Li-Yun, Hsiu-Man Liu, Ya-Wen Yu, Sheng-Dun Lin, and Jeng-Leun Mau. "Quality and antioxidant property of buckwheat enhanced wheat bread." *Food Chemistry* 112, no. 4 (2009): 987-991.
26. Belton, Peter S., and John RN Taylor, eds. *Pseudocereals and less common cereals: grain properties and utilization potential*. Springer Science & Business Media, 2002.
27. Wang, Qi, and Hongmei Zhu. "Processing effects on anti-nutrient factors of tartary buckwheat (Fagopyrum tataricum)." *Asian Journal of Agriculture and Food Sciences* 3, no. 6 (2015).
28. Loh, Wenyin, and Mimi LK Tang. "The epidemiology of food allergy in the global context." *International journal of environmental research and public health* 15, no. 9 (2018): 2043.
29. Taylor, John, and Joseph Awika, eds. *Gluten-free ancient grains: cereals, pseudocereals, and legumes: sustainable, Nutritious, and health-promoting foods for the 21st century*. Woodhead publishing, 2017.
30. Brennan, Margaret A., Carine Menard, Gaëlle Roudaut, and Charles S. Brennan. "Amaranth, millet and buckwheat flours affect the physical properties of extruded breakfast cereals and modulates their potential glycaemic impact." *Starch‐Stärke* 64, no. 5 (2012): 392-398.
31. Fuentes, Francisco, and X. I. M. E. N. A. Paredes-Gónzalez. "Nutraceutical perspectives of quinoa: biological properties and functional applications." *FAO and CIRAD: state of the art report of quinoa in the world in* (2013): 286-299.
32. Soriano-Garcia, M., Arias-Olguin, I.I., Montes, J.P.C., et al. (2018), “Nutritional functional value and therapeutic utilization of amaranth”, Journal of Analytical and Pharmaceutical Research, Vol. 7 No. 5, pp. 596-600.
33. Filho, Antonio Manoel Maradini, Mônica Ribeiro Pirozi, João Tomaz Da Silva Borges, Helena Maria Pinheiro Sant'Ana, José Benício Paes Chaves, and Jane Sélia Dos Reis Coimbra. "Quinoa: nutritional, functional, and antinutritional aspects." *Critical reviews in food science and nutrition* 57, no. 8 (2017): 1618-1630.
34. Vilcacundo, Ruben, and Blanca Hernández-Ledesma. "Nutritional and biological value of quinoa (Chenopodium quinoa Willd.)." *Current Opinion in Food Science* 14 (2017): 1-6.
35. Bender, D., and R. Schönlechner. "Recent developments and knowledge in pseudocereals including technological aspects." *Acta Alimentaria* (2021).
36. Fernández-López, Juana, Raquel Lucas-González, Manuel Viuda-Martos, Estrella Sayas-Barberá, Jaime Ballester-Sánchez, Claudia M. Haros, Asunción Martínez-Mayoral, and José A. Pérez-Álvarez. "Chemical and technological properties of bologna-type sausages with added black quinoa wet-milling coproducts as binder replacer." *Food chemistry* 310 (2020): 125936.
37. Bahmanyar, Fereshte, Seyede Marzieh Hosseini, Leila Mirmoghtadaie, and Saeedeh Shojaee-Aliabadi. "Effects of replacing soy protein and bread crumb with quinoa and buckwheat flour in functional beef burger formulation." *Meat science* 172 (2021): 108305.
38. Wang, Xuejiao, Niamat Ullah, Xuchun Sun, Yan Guo, Lin Chen, Zhixi Li, and Xianchao Feng. "Development and characterization of bacterial cellulose reinforced biocomposite films based on protein from buckwheat distiller’s dried grains." *International journal of biological macromolecules* 96 (2017): 353-360.
39. Li, Jiao, Xiaodong Cui, Xiaoli Ma, Chen Li, and Zhuanhua Wang. "Recombinant buckwheat trypsin inhibitor improves the protein and mitochondria homeostasis in Caenorhabditis elegans model of aging and age-related disease." *Gerontology* 65, no. 5 (2019): 513-523.
40. Salas-Valero, Lady M., Delia R. Tapia-Blácido, and Florencia C. Menegalli. "Biofilms based on canihua flour (Chenopodium pallidicaule): design and characterization." *Química Nova* 38 (2015): 14-21.
41. Tapia‐Blácido, D., Adriana Noemí Mauri, F. C. Menegalli, Pablo JA Sobral, and María Cristina Añón. "Contribution of the starch, protein, and lipid fractions to the physical, thermal, and structural properties of amaranth (Amaranthus caudatus) flour films." *Journal of Food Science* 72, no. 5 (2007): E293-E300.
42. TWB (2014) Quinoa has Reached NASA but is becoming Inaccessible for Andean Consumers, http://www.worldbank.org/en/news/feature/2014/01/06/quinua-llegahasta-la-nasa-pero-se-aleja-de-los-consumidores-andinos (accessed 22 October 2021)
43. Ruales, Jenny, Yolanda de Grijalva, Patricio Lopez-Jaramillo, and Baboo M. Nair. "The nutritional quality of an infant food from quinoa and its effect on the plasma level of insulin-like growth factor-1 (IGF-1) in undernourished children." *International journal of food sciences and nutrition* 53, no. 2 (2002): 143-154.
44. Haros, Claudia Monika, and Juan Mario Sanz-Penella. "Food uses of whole pseudocereals." *Pseudocereals: Chemistry and Technology, Wiley-Blackwell, Hoboken, New Jersey, USA* (2017): 163-192.
45. Cook, James D., Manju B. Reddy, Joseph Burri, Marcel A. Juillerat, and Richard F. Hurrell. "The influence of different cereal grains on iron absorption from infant cereal foods." *The American journal of clinical nutrition* 65, no. 4 (1997): 964-969.
46. Mezquita, P. Cerezal, E. Acosta Barrientos, G. Rojas Valdivia, N. Romero Palacios, and R. Arcos Zavala. "Development of a high content protein beverage from Chilean mesquite, lupine and quinoa for the diet of pre-schoolers." *Nutrición hospitalaria* 27, no. 1 (2012): 232-243.
47. Repo-Carrasco, Ritva, Clara Espinoza, and S-E. Jacobsen. "Nutritional value and use of the Andean crops quinoa (Chenopodium quinoa) and kañiwa (Chenopodium pallidicaule)." *Food reviews international* 19, no. 1-2 (2003): 179-189.
48. Deželak, Matjaž, Martin Zarnkow, Thomas Becker, and Iztok Jože Košir. "Processing of bottom‐fermented gluten‐free beer‐like beverages based on buckwheat and quinoa malt with chemical and sensory characterization." *Journal of the Institute of Brewing* 120, no. 4 (2014): 360-370.
49. Pineli, Lívia de L. de O., Raquel BA Botelho, Renata P. Zandonadi, Juliana L. Solorzano, Guilherme T. de Oliveira, Caio Eduardo G. Reis, and Danielle da S. Teixeira. "Low glycemic index and increased protein content in a novel quinoa milk." *LWT-Food Science and Technology* 63, no. 2 (2015): 1261-1267.
50. Lee, Beom-Seon, and Seung-Kook Park. "Volatile aromatic compounds and fermentation properties of fermented milk with buckwheat." *Korean Journal of Food Science and Technology* 45, no. 3 (2013): 267-273.
51. Wang, J. B. "Development and quality analysis of Tartary buckwheat compound yogurt." *Xihua University* (2013). 38, 167–171.
52. Giménez-Bastida, Juan Antonio, Mariusz K. Piskula, and Henryk Zielinski. "Recent advances in processing and development of buckwheat derived bakery and non-bakery products-a review." *Polish Journal of Food and Nutrition Sciences* 65, no. 1 (2015).
53. Qin, Likang, Xiufang Sui, Haiying Zeng, and Zhimin Xu. "Fortification of the Health Benefit of Buckwheat (F agopyrum tataricum) Tea." *Journal of Food Processing and Preservation* 38, no. 4 (2014): 1882-1889.
54. Ramos Diaz, Jose Martin, Lakshminarasimhan Sundarrajan, Susanna Kariluoto, Anna‐Maija Lampi, Seppo Tenitz, and Kirsi Jouppila. "Effect of extrusion cooking on physical properties and chemical composition of corn‐based snacks containing amaranth and quinoa: application of partial least squares regression." *Journal of Food Process Engineering* 40, no. 1 (2017): e12320.
55. Brennan, Margaret A., Carine Menard, Gaëlle Roudaut, and Charles S. Brennan. "Amaranth, millet and buckwheat flours affect the physical properties of extruded breakfast cereals and modulates their potential glycaemic impact." *Starch‐Stärke* 64, no. 5 (2012): 392-398.
56. Kuktaite, Ramune, Ritva Repo‐Carrasco‐Valencia, Cesar CH de Mendoza, Tomás S. Plivelic, Stephen Hall, and Eva Johansson. "Innovatively processed quinoa (Chenopodium quinoa W illd.) food: chemistry, structure and end‐use characteristics." *Journal of the Science of Food and Agriculture* (2021).
57. Guerra-Matias, Andrea C., and José AG Arêas. "Glycemic and insulinemic responses in women consuming extruded amaranth (Amaranthus cruentus L)." *Nutrition research* 25, no. 9 (2005): 815-822.
58. Schoenlechner, Regine, Ioanna Mandala, Alexandra Kiskini, Athanasios Kostaropoulos, and Emmerich Berghofer. "Effect of water, albumen and fat on the quality of gluten‐free bread containing amaranth." *International journal of food science & technology* 45, no. 4 (2010): 661-669.
59. Mariotti, Manuela, Stefania Iametti, Carola Cappa, Patrizia Rasmussen, and Mara Lucisano. "Characterisation of gluten-free pasta through conventional and innovative methods: Evaluation of the uncooked products." *Journal of Cereal Science* 53, no. 3 (2011): 319-327.
60. Marti, Alessandra, Maria Ambrogina Pagani, and Koushik Seetharaman. "Understanding starch organisation in gluten-free pasta from rice flour." *Carbohydrate Polymers* 84, no. 3 (2011): 1069-1074.
61. Marti, Alessandra, and Maria Ambrogina Pagani. "What can play the role of gluten in gluten free pasta?." *Trends in Food Science & Technology* 31, no. 1 (2013): 63-71.
62. Shewry, P. R., and S. J. Hey. "Do we need to worry about eating wheat?." *Nutrition bulletin* 41, no. 1 (2016): 6-13.
63. Junker, Y., Zeissig, S., Kim, S.J., Barisani, D., Wieser, H., Leffler, D.A., 2012. Wheat amylase trypsin inhibitors drive intestinal inflammation via activation of toll-like receptor 4. J. Exp. Med. 209, 2395–2408.
64. D’Amico, S., Schoenlechner, R., Tömösköszi, S., Langó, B., 2017. Proteins and amino acids of Kernels. In: Haros, M., Schoenlechner, R. (Eds.), Pseudocereals: Chemistry and Technology. Wiley-Blackwell, Oxford, UK, pp. 94–118, (Chapter 5).
65. De Arcangelis, Elisa, Francesca Cuomo, Maria Carmela Trivisonno, Emanuele Marconi, and Maria Cristina Messia. "Gelatinization and pasta making conditions for buckwheat gluten-free pasta." *Journal of Cereal Science* 95 (2020): 103073.
66. Singh, Mukti, and Sean X. Liu. "Evaluation of amaranth flour processing for noodle making." *Journal of Food Processing and Preservation* 45, no. 4 (2021): e15270.
67. Rudra, Shalini Gaur, Vishnu Anand, Charanjit Kaur, Neeru Bhooshan, and Rakesh Bhardwaj. "Hydrothermal Treatment to Improve Processing Characteristics of Flour for Gluten‐Free Pasta." *Starch‐Stärke* 72, no. 9-10 (2020): 1900320.
68. Carrizo, Silvana L., Alejandra de Moreno de LeBlanc, Jean Guy LeBlanc, and Graciela C. Rollán. "Quinoa pasta fermented with lactic acid bacteria prevents nutritional deficiencies in mice." *Food Research International* 127 (2020): 108735.

Urquizo, Fanny Emma Ludena, Silvia Melissa García Torres, Tiina Tolonen, Mari Jaakkola, Maria Grazzia Pena‐Niebuhr, Atte von Wright, Ritva Repo‐Carrasco‐Valencia, Hannu Korhonen, and Carme Plumed‐Ferrer. "Development of a fermented quinoa‐based beverage." *Food Science & Nutrition* 5, no. 3 (2017): 602.

Linares-García, Laura, Ritva Repo-Carrasco-Valencia, Patricia Glorio Paulet, and Regine Schoenlechner. "Development of gluten-free and egg-free pasta based on quinoa (Chenopdium quinoa Willd) with addition of lupine flour, vegetable proteins and the oxidizing enzyme POx." *European Food Research and Technology* 245, no. 10 (2019): 2147-2156.

Makdoud, Sarah, and Kurt A. Rosentrater. "Development and testing of gluten-free pasta based on rice, quinoa and amaranth flours." *Journal of food Research* 6, no. 4 (2017): 91-110.

Bastos, Gilsimeire Morais, Manoel Soares Soares Júnior, Márcio Caliari, Andressa Louise de Araujo Pereira, Carla Cristina de Morais, and Maria Raquel Hidalgo Campos. "Physical and sensory quality of gluten-free spaghetti processed from amaranth flour and potato pulp." *LWT-Food Science and Technology* 65 (2016): 128-136.

Kahlon, Talwinder S., Roberto J. Avena-Bustillos, Jenny L. Brichta, and Ashwinder K. Kahlon. "High-Protein Nutritious Flatbreads and an Option for Gluten-Sensitive Individuals." *Foods* 8, no. 11 (2019): 591.

Mert, Selen, Serpil Sahin, and Gulum Sumnu. "Development of gluten-free wafer sheet formulations." *LWT-Food Science and Technology* 63, no. 2 (2015): 1121-1127.

Kaur, Sukhmandeep, and Navjot Kaur. "Development and sensory evaluation of gluten free bakery products using quinoa (Chenopodium quinoa) flour." *Journal of Applied and Natural Science* 9, no. 4 (2017): 2449-2455.

Molinari, Romina, Lara Costantini, Anna Maria Timperio, Veronica Lelli, Francesco Bonafaccia, Giovanni Bonafaccia, and Nicolò Merendino. "Tartary buckwheat malt as ingredient of gluten-free cookies." *Journal of Cereal Science* 80 (2018): 37-43.

Jan, Khan Nadiya, P. S. Panesar, and Sukhcharn Singh. "Optimization of antioxidant activity, textural and sensory characteristics of gluten-free cookies made from whole indian quinoa flour." *Lwt* 93 (2018): 573-582.

Sharma, Ruchi, S. Mokhtari, S.M. Jafari, and Somesh Sharma. "Barley-based probiotic food mixture: health effects and future prospects." *Critical Reviews in Food Science and Nutrition* (2021): 1-15.

Sayed, Hala S., Amany M. Sakr, and Nahla MM Hassan. "Effect of pseudo cereal flours on technological, chemical and sensory properties of pan bread." *World J. Dairy Food Sci* 11, no. 1 (2016): 10-17.

Alencar, Natália Manzatti Machado, Caroline Joy Steel, Izabela Dutra Alvim, Elisa Carvalho de Morais, and Helena Maria Andre Bolini. "Addition of quinoa and amaranth flour in gluten-free breads: Temporal profile and instrumental analysis." *LWT-Food Science and Technology* 62, no. 2 (2015): 1011-1018.

Kahlon, Talwinder S., Roberto J. Avena-Bustillos, Jenny L. Brichta, and Ashwinder K. Kahlon. "High-Protein Nutritious Flatbreads and an Option for Gluten-Sensitive Individuals." *Foods* 8, no. 11 (2019): 591.

Bahmanyar, Fereshte, Seyede Marzieh Hosseini, Leila Mirmoghtadaie, and Saeedeh Shojaee-Aliabadi. "Effects of replacing soy protein and bread crumb with quinoa and buckwheat flour in functional beef burger formulation." *Meat science* 172 (2021): 108305.

Costantini, Lara, Lea Lukšič, Romina Molinari, Ivan Kreft, Giovanni Bonafaccia, Laura Manzi, and Nicolò Merendino. "Development of gluten-free bread using tartary buckwheat and chia flour rich in flavonoids and omega-3 fatty acids as ingredients." *Food chemistry* 165 (2014): 232-240.

Foucault, Anne‐Sophie, Véronique Mathé, René Lafont, Patrick Even, Waly Dioh, Stanislas Veillet, Daniel Tomé, Jean‐François Huneau, Dominique Hermier, and Annie Quignard‐Boulangé. "Quinoa extract enriched in 20‐hydroxyecdysone protects mice from diet‐induced obesity and modulates adipokines expression." *Obesity* 20, no. 2 (2012): 270-277.

Ruales, Jenny, Yolanda de Grijalva, Patricio Lopez-Jaramillo, and Baboo M. Nair. "The nutritional quality of an infant food from quinoa and its effect on the plasma level of insulin-like growth factor-1 (IGF-1) in undernourished children." *International journal of food sciences and nutrition* 53, no. 2 (2002): 143-154.

Farinazzi-Machado, Flávia Maria Vasques, Sandra Maria Barbalho, Marie Oshiiwa, Ricardo Goulart, and Osvaldo Pessan Junior. "Use of cereal bars with quinoa (Chenopodium quinoa W.) to reduce risk factors related to cardiovascular diseases." *Food Science and Technology* 32 (2012): 239-244.

De Carvalho, Flávia Giolo, Paula Payão Ovídio, Gilberto Joao Padovan, Alceu Afonso Jordao Junior, Julio Sérgio Marchini, and Anderson Marliere Navarro. "Metabolic parameters of postmenopausal women after quinoa or corn flakes intake–a prospective and double-blind study." *International Journal of Food sciences and nutrition* 65, no. 3 (2014): 380-385.

Ruiz, Abellán, Barnuevo Espinosa, Contreras Fernández CJ, Guillén Guillén, Luque Rubia AJ, Quinde Ràzuri FJ, and López Román FJ. "Effect of quinua (Chenopodium quinoa) consumption as a coadjuvant in nutritional intervention in prediabetic subjects." *Nutricion hospitalaria* 34, no. 5 (2017): 1163-1169.

Qiu, Ju, Yanping Liu, Yanfen Yue, Yuchang Qin, and Zaigui Li. "Dietary tartary buckwheat intake attenuates insulin resistance and improves lipid profiles in patients with type 2 diabetes: a randomized controlled trial." *Nutrition Research* 36, no. 12 (2016): 1392-1401.

Stringer, Danielle M., Carla G. Taylor, Paulyn Appah, Heather Blewett, and Peter Zahradka. "Consumption of buckwheat modulates the post-prandial response of selected gastrointestinal satiety hormones in individuals with type 2 diabetes mellitus." *Metabolism* 62, no. 7 (2013): 1021-1031.

Paśko, Paweł, Paweł Zagrodzki, Henryk Bartoń, Joanna Chłopicka, and Shela Gorinstein. "Effect of quinoa seeds (Chenopodium quinoa) in diet on some biochemical parameters and essential elements in blood of high fructose-fed rats." *Plant foods for human nutrition* 65, no. 4 (2010): 333-338.

Olguín-Calderón, Diana, Jorge L. González-Escobar, Rosalva Ríos-Villa, Elena Dibildox-Alvarado, De Leon-Rodriguez, and Ana P. Barba de la Rosa. "Modulation of caecal microbiome in obese mice associated with administration of amaranth or soybean protein isolates." *Polish Journal of Food and Nutrition Sciences* 69, no. 1 (2019).

Jorge, Soriano Santos, Reyes Bautista Raúl, Guerrero-Legarreta Isabel, Ponce-Alquicira Edith, E-BH Bernardo, A-PJ César, Diaz-Godinez Gerardo, and Romn-Ramos Ruben. "Dipeptidyl peptidase IV inhibitory activity of protein hydrolyzates from Amaranthus hypochondriacus L. Grain and their influence on postprandial glycemia in Streptozotocin-induced diabetic mice." *African Journal of Traditional, Complementary and Alternative Medicines* 12, no. 1 (2015): 90-98.

Laparra, José Moisés, and Monika Haros. "Inclusion of ancient Latin-American crops in bread formulation improves intestinal iron absorption and modulates inflammatory markers." *Food & function* 7, no. 2 (2016): 1096-1102.

Liu, Wei, Yu Zhang, Bin Qiu, Shoujin Fan, Hanfeng Ding, and Zhenhua Liu. "Quinoa whole grain diet compromises the changes of gut microbiota and colonic colitis induced by dextran Sulfate sodium in C57BL/6 mice." *Scientific reports* 8, no. 1 (2018): 1-9.